ICEC4 — Fourth International Cryogenic Engineering Conference

The fourth International Cryogenic Engineering Conference was held in Eindhoven, Holland on 24–26 May. This year's conference was the first to be co-sponsored by the newly formed commission A2 of the IIR. The conference programme was arranged with particular emphasis on the design and developments of new low temperature devices and refrigeration equipment. The topics covered ranged from superconducting train suspensions to cryobiology. The eight invited review papers clearly reflected the main areas of interest and controversy.

The first paper to be presented was Prof A. Lacaze's 'Trends in the use of very low temperature refrigeration'. Prof Lacaze pointed out that as yet there were no major industrial techniques in the range 1–20 K. There was a vicious circle operating in that low temperatures would have more applications if they were cheaper and refrigerators would be cheaper if they were used more.

One area where low temperature refrigeration was being considered was telecommunications where a small cooling power produces a large reduction in thermal noise. In the not-too-distant future we may see the introduction of superconducting cables for electrical power transmission although an increase of about 10–20% in the critical temperatures of superconductors would make this more feasible. Superconducting magnets will also probably become widely used in magnetically leviated transport and in MHD power generators or fusion generating plants. And why not use liquid hydrogen as a fuel for ground transport to reduce air pollution? Prof Lacaze claimed LH_2 was not really dangerous to handle although this was disputed by several members of the audience in the ensuing discussion.

H. G. Nöller in his paper 'Why cryopumping' outlined the principle behind this technique. The first application of LHe for cryopumping was in 1957. Cryopumps are not normally used until vacuums of about 10^{-3} to 10^{-4} torr have been reached in order to prevent the condensed solid gas layers becoming too thick. Cryopumps only really become economical when high pumping speeds are required. Two types are currently in use – one based on the bath principle and the other on the continuous flow principle. Their future use will probably depend on the development of economical integrated units of cryopumps and refrigerators.

The final review paper of the first session was by W. Hogan on that controversial topic 'Helium conservation in the USA'. Mr Hogan started by pointing out that most people did not appreciate the real issues behind the cancellation of the helium conservation programme and only supported helium conservation since conservation of anything nowadays seemed a good idea. He outlined the economics behind the programme set-up in 1960 and described how it had failed because some private contractors had undercut the government by selling helium at less than the government agreed price. This meant that the programme was now being supported by the US tax-payer.

Turning to the wider issue of the impending US energy crisis. Mr Hogan pointed out that the natural gas now being drawn out to satisfy present demands contains helium far in excess of any current or projected demand. As about 20% of the helium is conserved, 5% used, and 70% wasted, this hardly constitutes a true conservation programme.

The price of helium is probably now as cheap as it will ever be. By the turn of the century all helium-rich natural gas fields will be depeleted although vast resources probably still remain in proven and speculative reserves. Maybe massive amounts of helium will need to be consumed in a search to find new energy sources to overcome the impending energy crisis.

Supplies of helium will therefore last out as long as natural gas supplies are available. But instead of stockpiling for the immediate future we should look beyond this and try to develop economical methods of extracting helium from the atmosphere. The minimum thermodynamic energy required to separate helium from air at room temperature is about the same as the minimum energy to liquefy helium – if the efficiency of this process could be increased we would have a permanent solution to our helium supply problem.

The second day of the conference commenced with a paper by K. Oshima and Y. Kyotari on 'Magnetically suspended trains in Japan'. By 1977 or 78 Japan's new Tokaido Line – the fastest commuter train in the world will reach limiting capacity. A 1970 study group at Japanese National Railways decided new high speed transportation with an average speed of 450 km h^{-1} would be required. The system chosen was a superconducting magnetic levitation system with linear motor drive. In 1971 a research and development programme started on both these systems in parallel. It is aimed by 1975 to develop a levitation system which can be adopted as a final transportation system. A basic test facility able to test such a system up to 100 km h^{-1} has already been constructed and a small pilot train will be operating by the end of this year. The system must be completed by 1980 and to attain this the help of cryogenic engineers throughout the world will be required.

'Why cryogenics in the power industry?' was the title of the paper presented by J. J. Went. Since 1920 electric energy consumption has been increasing twice as fast as total energy production. Mr Went saw future power stations as consisting of three or four 1 000–1 200 mW units interconnected across countries and continents by